ASTRONOMICAL SOCIETY OF LONDON.

November 13, 1829. No. 22.

THE following communications were read:—

1st. A List of the Occultations of Aldebaran by the Moon, in the year 1830, computed, for ten different Observatories in Europe, by Thomas Henderson, Esq. and Thomas Maclear, Esq., at the request of the Council.

1830.	PLACE.	IMMERSIONS.			EMERSIONS.		
		Sidereal time.	Mean solar time.	Angle.	Sidereal time.	Mean solar time.	Angle.
		h m	h m	deg.	h m	h m	deg.
Jan. 5	Konigsberg	12 3	17 2	346	below	the	horizon.
	Milan	11 26	16 25	327	below	the	horizon.
	Paris	10 56	15 55	328	11 47	16 46	117
	Greenwich.	10 44	15 43	331	11 34	16 33	113
	Bedford ..	10 42	15 41	332	11 32	16 31	110
	Edinburgh.	10 27	15 26	336	11 16	16 15	100
	Dublin ...	10 16	15 16	330	11 8	16 7	110
March 1	Naples ...	0 56	2 20	310	1 13	2 38	341
May 22	Milan	11 35	7 35	348	below	the	horizon.
	Paris	11 6	7 7	351	11 47	7 47	96
	Greenwich.	10 56	6 57	356	11 34	7 34	89
	Bedford ..	10 54	6 54	356	11 31	7 31	87
	Edinburgh.	10 42	6 42	4	11 13	7 13	75
	Dublin ...	10 28	6 29	355	11 7	7 8	88
July 16	Konigsberg	..	..	a near	appulse.	..	..
	Vienna ...	8 51	1 15	1	9 35	2 0	96
	Naples ...	8 43	1 7	343	9 42	2 6	130
	Milan	8 16	0 40	349	9 12	1 36	114
	Paris	7 41	0 6	352	8 34	0 59	103
	Greenwich.	7 30	23 55	356	8 17	0 42	90
	Bedford ..	7 29	23 54	358	8 14	0 39	87
	Edinburgh.	7 20	23 45	13	7 47	0 12	63
	Dublin ...	6 59	23 24	358	7 43	0 7	82

1830.	PLACE.	IMMERSIONS.			EMERSIONS.		
		Sidereal time.	Mean solar time.	Angle.	Sidereal time.	Mean solar time.	Angle.
		h m	h m	deg.	h m	h m	deg.
Oct. 5	Vienna ...	8 58	20 0	36	9 12	20 14	63
	Naples ...	8 38	19 40	2	9 28	20 30	111
	Milan	8 14	19 16	11	8 55	19 57	92
	Paris	7 43	18 46	19	8 14	19 16	76
	Greenwich.	..	..	a near	appulse.	..	..
Nov. 29	Dorpat ...	10 4	17 30	11	10 30	17 56	68
	Konigsberg	9 36	17 2	355	10 17	17 42	90
	Vienna ...	9 20	16 46	339	10 13	17 39	118
	Naples ...	9 18	16 44	325	10 14	17 40	148
	Milan	8 50	16 16	330	9 48	17 14	135
	Paris	8 15	15 41	332	9 14	16 40	126
	Greenwich.	8 2	15 28	335	8 59	16 25	116
	Bedford ..	8 0	15 26	336	8 56	16 22	114
	Edinburgh.	7 45	15 11	342	8 37	16 2	99
	Dublin ...	7 30	14 56	335	8 27	15 53	110

In the preceding ephemeris, the column marked *Angle* denotes the point of the moon's limb where the phenomenon will take place, reckoning from the vertex, or highest point of the moon's limb, towards the west, or right hand, round the circumference.

The object of the Council, in procuring these computations, has been to induce astronomers to look out for the occultations, with a view principally to determine whether Aldebaran will *appear projected on the face of the moon*, as has frequently been observed in former occultations of this star. It is therefore requested, that particular attention be paid to the following circumstances: viz. 1. whether the star undergoes any change of light, of colour, or of motion, on its immediate approach to the edge of the moon; 2. whether it appears to be projected on the moon's disc, and for how long a time; 3. whether the dark limb of the moon be distinctly visible and well defined at the time of the phenomenon; 4. whether the star, on its emersion, appears on the moon's disc, or emerges quite clear of the moon's border.

In recording the observations, it is desirable that the observer should describe the telescope made use of, and that the same instrument should be employed in observing both the immersion and emersion; that it should be noted whether the telescope was adjusted to the moon or to the star, and whether it had been altered during the observations. And as it is probable that the phenomenon may differ in some slight particulars, even to persons observing together in the same place, it is hoped that the actual appearances will be

recorded (as they may present themselves) by each person, without suffering his impression to be biassed by the opinion or representation of others.

It is further requested, that, in recording such observations as may be made, the *correct* time (as well as the place) of observation may be given; that is, the time shewn by the clock *corrected* for its *error*, in order that comparisons may be made of the best mode of computing occultations. Two different methods have been pursued in computing the ephemeris here given; and although the results have agreed sufficiently near to enable the Council to ascertain the time to the nearest minute, yet in some of the cases the results have varied from each other much more than might have been expected. The computations will probably be revised and investigated, when the correct time and place are ascertained.

2nd. Numerous observations of the Occultations of Aldebaran on the 21st of August and on the 15th of October, 1829, of which the following are brief abstracts, arranged alphabetically:—

I. OCCULTATION ON THE 21st OF AUGUST, 1829.

BEDFORD—Capt. Smyth's Observatory.

Observer, Capt. Smyth.

Emersion at $4^h\ 59^m\ 49^s,63$, sidereal time. Instrument, 5-feet achromatic. Dark limb of the moon invisible.

BIGGLESWADE—Mr. Maclear's Observatory.

Observer, Mr. Maclear.

Emersion at $5^h\ 0^m\ 54^s,0$ sidereal time. Instrument, the Society's Wollaston achromatic. Dark limb invisible.

GENEVA—The Observatory.

Observers, Messrs. Gautier, Bouvard, and Gambart.

M. Gautier saw no projection of the star on the disc: M. Bouvard saw it projected on the disc one or two seconds: M. Gambart perceived the projection about three seconds.

GREENWICH—Royal Observatory.

Observers, The Astronomer Royal, Messrs. Taylor, Henry, Richardson, Taylor, jun., and Rogerson.

Emersion, the mean of the six observations, $23^h\ 25^m\ 57^s,36$. Dark limb invisible.

LIVERPOOL.

Observer, Mr. W. Lassett, jun.

Star, previous to the immersion, seen projected upon the disc, a quantity equal to its own diameter. Instrument, 9-feet Newtonian reflector, of 9 inches aperture, of which 6 inches only were employed.

PARIS—The Royal Observatory.

Observers, Messrs. Arago, Mathieu, and Savary.

Previous to the emersion, M. Arago saw the star distinctly on the bright disc about two seconds. M. Mathieu accords with M. Arago. M. Savary states, that the star left, to his eye, a shadow in the place it occupied on the moon's face.

Unfavourable weather prevented this occultation from being observed at Kensington, London, in Scotland, or Ireland.

II. OCCULTATION ON THE 15th OF OCTOBER, 1829.

BEDFORD—Capt. Smyth's Observatory.

Observers, Capt. Smyth and John Lee, LL.D.

Immersion at $22^h\ 48^m\ 18^s{,}96$ sidereal time — Emersion at $23^h\ 24^m\ 7^s{,}89$. Prior to immersion the star was seen within the lunar disc two seconds and a quarter of time. Both observers agree. Instruments, 5 and $3\frac{1}{2}$ feet achromatics.

BIGGLESWADE—Mr. Maclear's Observatory.

Observers, Mr. Maclear and the Rev. Mr. Bromhead.

Three seconds intervened between the star's first moving forward on the moon's face, and its disappearance. Both observers agree. Instruments used, the Society's Wollaston achromatic, and a 46-inch achromatic.

BLACKHEATH—Montpellier Terrace.

Observer, Mr. Wrottesley.

The star seen projected on the disc of the moon two seconds. Instrument, 5-inch Gregorian reflector.

CHISELHURST—Parsonage.

Observer, Rev. Mr. Hussey.

The star appeared to indent the moon during one second and a half. Instrument, 49-inch achromatic.

ST. GEORGE'S IN THE EAST—Prince's Square.

Observer, Mr. Epps.

Star seen projected on the disc; interval between its first contact and its disappearance, six seconds. Instrument, 30-inch achromatic.

GREENWICH—The Hospital.

Observer, Mr. Riddle.

Star observed on the lunar disc about one second and seven-tenths. Instrument, 30-inch achromatic.

GREENWICH—The Royal Observatory.

Observers, The Astronomer Royal, Messrs. Taylor, Henry, Richardson, Taylor, jun., and Rogerson.

The Astronomer Royal observed the immersion at $22^h\ 48^m\ 27^s,54$, the emersion at $23^h\ 25^m\ 57^s,04$, sidereal time. The star seemed to hang on the limb, or rather within it, about three seconds of time, and then suddenly disappeared. Instrument, 5-feet equatorial.

Mr. Taylor dates the immersion at $22^h\ 48^m\ 28^s,24$; the emersion at $23^h\ 25^m\ 57^s,24$: to him the star appeared on the disc three seconds, and disappeared, leaving an indentation in the moon's border. Instrument, the 46-inch achromatic.

Mr. Henry observed the immersion at $22^h\ 48^m\ 27^s,69$; the emersion at $23^h\ 25^m\ 57^s,04$. The star seemed to hang on the edge of the moon 5 or 6 seconds. Instrument, 7-feet reflector.

Mr. Richardson gives for the immersion $22^h\ 48^m\ 27^s,89$; for the emersion $23^h\ 25^m\ 57^s,54$. The star seen projected on the moon's disc a quantity equal to two of its own diameters. Previous to its disappearance, the quantity of projection decreased, making an indentation in the moon's border. Instrument, 30-inch achromatic.

Mr. Taylor, jun. observed the immersion at $22^h\ 48^m\ 27^s,89$; the emersion at $23^h\ 25^m\ 57^s,14$. The star was totally included within the moon's limb three seconds before its disappearance. Instrument, 10-feet reflector.

Mr. Rogerson saw the star projected on the disc two or three seconds prior to the immersion, which took place at $22^h\ 48^m\ 27^s,34$; the emersion at $23^h\ 25^m\ 58^s,14$. Instrument, 5-feet achromatic.

ISLINGTON—The Terrace.

Observer, Mr. Simms.

The star seen projected on the disc, previous to occultation, three seconds and a half. Instrument, 45-inch achromatic.

SOUTH KILWORTH—Parsonage.

Observer, The Rev. Dr. Pearson.

Observed the star lying on the moon's limb from $3\frac{1}{2}$ seconds to 4 seconds. Instrument, achromatic of $3\frac{3}{4}$ inches aperture.

KENSINGTON—The President's Observatory.

Observers, Captain Beaufort, Captain Wilson, and Mr. Stratford.

Captain Beaufort observed the immersion at $22^h\ 47^m\ 47^s,68$; the emersion at $23^h\ 25^m\ 4^s,0$. The star was seen to advance upon the moon's limb till its whole diameter was inside the disc. Interval between the star's bisection by the limb and its disappearance was five seconds. Observed with $8\frac{1}{2}$ feet achromatic of $5\frac{9}{10}$ inches aperture.

Captain Wilson determined the immersion at $22^h\ 47^m\ 48^s,18$, and the emersion at $23^h\ 25^m\ 2^s,30$. For three seconds previous to the star's disappearance it was embedded in the moon's limb, with a dark line between the moon and the star. During its advance upon the limb, the star seemed to have its path deranged about 15° towards the moon's centre. Instrument, 5-feet achromatic, of 4 inches aperture.

Mr. Stratford saw the star completely embedded on the body of the moon about three seconds. Immersion at $22^h\ 47^m\ 49^s,18$, (probable error of 1^s in excess); emersion at $23^h\ 25^m\ 3^s,80$. Instrument, 5-feet equatorial.

LAVENDER HILL—Mr. A. Baily's Observatory.

Observer, Mr. A. Baily.

Previous to its disappearance, the star was seen projected on the moon's disc three seconds and two-tenths. Instrument, 5-feet achromatic.

MARSEILLES—Royal Observatory.

Observer, M. Gambart.

Star seen entirely projected on the disc, prior to its occultation, during two seconds. Instrument, 5-feet achromatic.

PARIS—Aux Bains de Tivoli, Rue St. Lazare.

Observer, M. le Baron de Zach.

The Baron saw nothing anomalous; the moment the star came in contact with the moon's limb it disappeared. Instrument, 30-inch achromatic and 40 lines aperture; its object-glass vitro-crystalline, by Cauchoix.

PARIS—À l'Observatoire de l'École Militaire.

Observer, M. Damoiseau.

Star seen adhering to the moon's limb, or as if entangled with it, about one second, but not projected on the disc.

PARIS—À l'Observatoire Royal.

Observers, Messrs. Bouvard, Arago, Mathieu, Nicollet, Savary, and the President.

M. Bouvard saw no projection of the star on the moon's disc. Instrument, 5-feet achromatic, of 4 inches aperture; power about 60.

M. Arago saw the star bisected by the moon's limb, at which time it instantaneously disappeared; the star's semi-diameter was seen on the disc. Instrument, 11-feet achromatic, by Lerebours, of $8\frac{1}{4}$ English inches clear aperture; power about 80 or 90.

M. Mathieu saw the star advance upon the moon's limb about the half of its own diameter; it rested there one second and a half, and then instantly disappeared. The phenomenon of projection, M. M. states, was not so strongly marked as on the last

occultation, of the 21st of August. Instrument, the telescope of Reichenbach's repeating circle.

M. Nicollet observed the star projected on the moon's disc, previous to the immersion, about one second and a half. Instrument, achromatic, by Lerebours, of 6 inches aperture.

M. Savary saw the star only partially projected on the moon's disc. Instrument, 5-feet equatorial.

The President, disregarding the clock, fixed his entire attention upon the star; he saw it gradually advance towards the moon's limb; as soon as the contact occurred, the star's apparent eastern rays became gradually invisible, and the instant the star was dichotomised it disappeared. He could detect none of the star's rays projected on the disc. Instrument, 19-feet achromatic of 11 inches and 7-tenths clear aperture, with a power of 360. Both the star and limb, although tremulous, were at moments exquisitely defined. The telescope was adjusted to focus upon the moon's limb.

PARIS — Quai Voltaire.

Observer, M. Pouillet.

If the star did not disappear the moment it came in contact with the limb, it remained there no appreciable time. The moon's limb did not certainly appear behind the star. Instrument achromatic.

Lat. 48° 40′ 50″ N. Long. 11″,5 East of Paris.

Observer, M. Francœur.

The star was seen projected on the disc about four seconds. As the star approached the moon its red tint became diminished, till it resembled the colour of the planet Venus. Instrument achromatic.

PASSY — Terrace in M. B. Delessert's Garden.

Observers, Messrs. Benjamin, François, and Gabriel Delessert.

The instant the star came into contact with the moon's disc it disappeared. All the observers agree.

EAST TYTHERLEY — Tytherley House.

Observer, Mr. F. Baily.

No projection of the star on the disc — nor any thing anomalous detected. Instrument, 42-inch achromatic.

WOOLWICH — Mr. Barlow's Observatory.

Observers, Professor Barlow and Mr. Barlow, jun.

Star seen completely on the moon's disc. Instruments, achromatics of 8 inches and 3 inches aperture; the object-glasses formed with carburet of sulphur. Both observers agree.

Mr. Barlow, in his communication relative to this occultation,

gives the following, as proofs of the capability of his fluid object-glass in exhibiting minute stars:—Following α Serpentis about 30″, he sees a fine, brilliant, but small star; preceding β Serpentis, and at nearly the same distance, a similar star is perceived; south, preceding α Andromedæ, and at a distance of about 40″, is also a small star; forming with the double star α Herculis a very acute-angled triangle, he perceives a small star, not so faint as any of the preceding test stars, but which he thinks would have been registered with α Herculis had it been seen. Again, near Capella, there is a small star at one-third of the distance of the star mentioned by Sir W. Herschel, which, as it is by no means difficult to detect, he is surprised has not been noticed. And lastly, the annular nebula of Lyra has a fine star following it at about 10″; another at a little greater distance; and a third, preceding about 20″, only visible at intervals.

Mr. Barlow concludes his paper by wishing to know how these several objects are seen in the President's large achromatic.*

It is right to remark, that in all the observations here recorded, the moon's dark limb was not visible.

Unfavourable weather prevented the occultation from being observed either in Scotland or in Ireland.

3rd. A letter from Professor Barlow to the President, suggesting an explanation of the cause of the projection of a star upon the moon's disc. This communication having, however, been subsequently withdrawn by the author for reconsideration, the abstract thereof is deferred.

4th. On a method of determining the mass of the moon, from transit observations of Venus, near her inferior conjunction. By Professor Airy.

In consequence of the action of the moon upon the earth, the earth's place is affected with an inequality depending on the moon's position, and proportional to the fraction

$$\frac{\text{Moon's mass}}{\text{Earth's mass} + \text{moon's mass}}$$

The observed magnitude of the corresponding inequality in the sun's $\mathcal{R}$ has often been used to determine the value of this fraction. Observations of any other body might, however, be used for the same purpose: and if a body could be found whose distance from the earth was less than the sun's distance, the inequality in its $\mathcal{R}$ would be greater than that in the sun. It is now proposed by

* Since the instrument here alluded to has been in England, it has not been directed to any celestial object. When in Paris, however, it was placed on the annular nebula in Lyra. The small star seen by Mr. Barlow, and estimated by him at 10″ distance, was exhibited almost in contact with the exterior border of the nebula, and capable of bearing considerable illumination of the field. Unless, also, my memory deceives me, there was in the field, with α Herculis, a very minute double star, which I never remember to have previously seen.—J. S.

Professor Airy to observe the $\mathcal{R}$ of the bright limb of Venus, when near her inferior conjunction (at which time her distance is less than $\frac{1}{3}$ of the sun's distance), and, by comparison of the observed $\mathcal{R}$ with that given by the Berlin Ephemeris, to find the error in the moon's mass adopted in that work. The author states, that a similar suggestion has been made by Professor Bianchi with regard to observations of Mars, near opposition in September 1830; and concludes his paper with an ephemeris of Venus for every day of the months of January, February, March, April, and part of May, computed for Berlin; wherein is given, 1st, the approximate N.P.D. of the centre of Venus; 2d, the *apparent* $\mathcal{R}$ of the *bright* limb of Venus on the meridian of Berlin; 3d, logarithms of certain quantities to facilitate the reduction of the tabulated right ascensions for Berlin, to the $\mathcal{R}$ for any other meridian; 4th, the increase of the $\mathcal{R}$ of Venus, in seconds of time, depending on the mass of the moon.

5th. A paper by Mr. Lubbock, being an addition to that read in January last, on the determination of the orbit of a comet.

The author gives the equations relating to this problem, retaining the 3rd and 4th powers of the time, which must be neglected in a first approximation; and he shews how, by a very simple method, the distance of a comet from the earth, obtained approximately, may be afterwards corrected.

At the conclusion of the business of the evening, the President informed the Society, that he had had the good fortune, during the recess, to procure an achromatic object-glass of eleven inches and seven-tenths clear aperture, and of nineteen feet focal length, the work of M. Cauchoix, of Paris; that he observed with it, at the Royal Observatory of Paris, the occultation of Aldebaran by the moon in October last; and that Mr. Troughton had undertaken the arduous task of forming with it an equatorial instrument. The flint glass employed in its construction was the manufacture of the late Guinand le Père, seems to be absolutely perfect, and is a remarkable instance of what persevering industry can achieve, under circumstances the most discouraging.

The President expressed himself under the deepest obligations to his Grace the Duke of Wellington, for the protection and encouragement which, at the instance of Lord Ashley, he had extended to the importation of the object-glass in question, and which, said the President, "will conduce to the placing in the hands of a private individual an instrument which, for delicate astronomical observations, will be superior to any which human ingenuity has hitherto contrived."

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